ECT 213
COURSE

LANEY COLLEGE
ENVIRONMENTAL CONTROL TECHNOLOGY

Commercial HVAC Systems Program

ECT 213 Indoor Air Quality and Building Envelope

Courtesy of National Science Foundation – BEST Center
www.BESTctr.org

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ENVIRONMENTAL CONTROLS TECHNOLOGY

Course Documentation

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Career and Technical Education Division
900 Fallon Street
Oakland, CA 94607
Phone 510-464-3292

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Catalog description

Introduction to building indoor air quality standards and maintenance procedures associated with comfort and health problems faced by workers and managers. Building envelope and testing procedures for proper service and maintenance of building heating, cooling and ventilation systems.

Lecture Hours: 17.5

Laboratory Hours: 0

Units

Semester Credit Hours: 1

Entry skills needed

- Recommended pre-requisite ECT 22 – Commercial HVAC Systems
- College-level reading and writing skills
- College-level math skills

Syllabus

See Appendix A for sample syllabus, course schedule, and policies. For lesson topics to include in course, see course schedule and Exit Skills.

Student learning outcomes

IAQ Standards

Describe the required standards for cleaner indoor environment.

IAQ Inspection Procedures

Explain proper inspection procedures for evaluating good and poor indoor air quality.

Procedures for Safely Maintaining IAQ

Demonstrate usage of proper and safe procedures and instruments for cleaning and maintaining indoor environment and equipment.

Exit skills

Course content to achieve outcomes listed above:

1. Explain the required standards for cleaner and healthier indoor air quality.
2. Identify the symptoms of poor indoor air quality.
3. Explain how to inspect and evaluate a building's structure and equipment for causes of poor indoor air quality.
4. Identify the HVAC equipment and accessories that are used to sense, control, and enhance indoor air quality.
5. Explain how to use selected test instruments to measure or monitor the quality of indoor air.
6. Describe the general procedures used to clean ducts and HVAC equipment.
7. Describe the proper procedures used for changing filters.

Course materials

Principal text

Indoor Air Quality, John L. Berggren, LAMA Books, ISBN 0-88069-022-4

Lecture materials and handouts

This course is strictly an overview course and makes significant use of handouts and online resources:

1. ASHRAE Standards 62.1 & 62.2
2. U.S. EPA Indoor Air Quality webpages - https://www.epa.gov/indoor-air-quality-iaq
3. Indoor Air Quality Association (IAQA) - https://iaqa.org/
4. Miscellaneous Laney ECT handouts re: common pollutants and ventilation

Other reference materials

Additional as needed

Software needed

None required

Equipment & test kits recommended for demonstrations

Sample equipment include:

- Data loggers/detectors for monitoring carbon monoxide and CO2
- Radon gas test kits
- Mold and lead-based paint test kits

Carbon monoxide detector

Radon gas test kit

Assessment

Methods

- Classroom participation & attendance
- Homework and/or written assignments
- Course exams (mid-term & final exam)
- Student presentations are optional.

Sample test questions

1. Which of the following is known as the "silent killer"?
   a. carbon dioxide
   b. carbon tetrachloride
   c. carbon monoxide
   d. monodioxide

2. _____ ventilation is a control strategy used to maintain a high oxygen content in buildings where a healthy environment is of particular concern.
   a. demand
   b. outside
   c. purge
   d. smoke

3. The most economical means of measuring the amount of oxygen deprivation in an occupied space is through the use of:
   a. a carbon dioxide sensor
   b. an oxygen sensor
   c. a nitrogen sensor
   d. a smoke detector

4. Which of the following is the natural result of combustion?
   a. carbon dioxide
   b. water vapor
   c. carbon monoxide
   d. all of the above

5. The most serious result of incomplete combustion in any fuel burning heating device is:
   a. carbon dioxide
   b. water vapor
   c. carbon monoxide
   d. nitrogen

6. Carbon monoxide poisoning is often mistaken for:
   a. the flu with a headache
   b. cancer
   c. a mild cold
   d. none of the above

7. Which of the following organizations has legal oversight over air quality in the United States?
   a. EPA
   b. ARI
   c. RSES
   d. ASHRAE

8. Outdoor air intake dampers should be located away from:
   a. busy ground level intersections
   b. loading docks
   c. sewer vents
   d. all of the above

9. Off-gassing is:
   a. the release of volatile compounds from products and construction materials
   b. usually harmful compounds and chemicals which slowly enter living spaces over time
   c. chemicals released into the air especially as the host material is heated
   d. all of the above

10. Indoor air quality is legally the responsibility of:
    a. the building owner
    b. the business leasing the building
    c. those operating and maintaining the building
    d. all of the above

Adaptability to on-line format

This course is predominantly lecture-based and is potentially compatible with distance learning delivery.

Appendix A – Sample syllabus

LANEY COLLEGE
INDOOR AIR QUALITY AND BUILDING ENVELOPE
Environmental Controls Technology
Spring Semester - 2016

Course:	Indoor Air Quality
Course No. /Code:	ECT 213 / 21863
Units:	1 Unit
Date/Time:	Thursday 6:00 – 7:00 PM
Instructor:	Adan Rosillo
Office:	**B151**
Office Hours:	6:00 – 7:00 Tu – Wed, Fr
Phone:	(510) 464-3292
Email:	arosillo@peralta.edu

Course Description:

Discussion of the terminology, measurements and study of issues that compromise and/or improve indoor air quality. An introduction to building indoor air quality standards and maintenance procedures associated with comfort and health problems faced by workers and managers.

Exit Skill:
Students will be able to:

1. Explain the required standards for cleaner and healthier indoor air quality.
2. Identify the symptoms of poor indoor air quality.
3. Explain how to inspect and evaluate a building's structure and equipment for causes of poor indoor air quality.
4. Identify the HVAC equipment and accessories that are used to sense, control, and enhance indoor air quality.
5. Explain how to use selected test instruments to measure or monitor the quality of indoor air.
6. Describe the general procedures used to clean ducts and HVAC equipment.
7. Describe the proper procedures used for changing filters.

Prerequisites: none, ECT 22 recommended

Text: "Indoor Air Quality", John L. Berggren, LAMA Books, ISBN 0-88069-022-4

Course schedule:

Week	List of Topics and Assignments
1	**Introduction to Indoor Air Quality (IAQ)**
2	**Causes & Sources of Indoor Air Quality Problems**
3	**Risk due to Indoor Air Pollutants** Homework #1
4	**Indoor Air Pollutants: Volatile Organic Compounds**
5	**Indoor Air Pollutants: Inorganic Compounds and Heavy Metals**
6	**Indoor Air Pollutants: Respirable Particles (smoke, diesel emissions, etc.)**
7	**Indoor Air Pollutants: Bio aerosols and Radon**
8	**IAQ Assessment of Commercial Buildings: Preliminary Assessments** Homework #2
9	**IAQ Assessment of Commercial Buildings: Self-Evaluation of IAQ Problems**
10	*MID-TERM ASSESSMENT*
11	**IAQ Assessment of Commercial Buildings: Sampling Techniques**
12	**IAQ Assessment of Commercial Buildings: General recommendations** Lab Practice #1
13	**IAQ Assessment of Commercial Buildings: Assessment summary, conclusions and follow-up assessments**
14	**IAQ Assessment of Commercial Buildings: Indoor quality controls and best practices** Lab Practice #2
15	**No Classes**
16	**IAQ Design Problems**
17	**IAQ Case Studies**
18	*FINAL EXAM*

Evaluation: The following classroom work and projects will be evaluated and graded.

1. Homework	15	100%-90%	A
2. Midterm	30	89%-80%	B
3. Attendance	15	79%-70%	C
4. Final Exam	40	69%- 60%	D
		Below 60%	F
Total points:	**100**		

Attendance: Students may be dropped from the course if the number of absences exceeds two days' worth of class meetings. However, extenuating circumstances may warrant consideration. **Note:** During class, please turn off all cell phones, also no eating or drinking. You will be given two breaks of ten minutes each between classes.

Note: It is the student's responsibility to drop any classes.

(Note to colleges using this documentation: policies regarding cheating should be incorporated as needed by your institution.)

BEST Center Curricula, Resources & Recordings

Academic Programs
Georgia Piedmont Technical College - Building Automation Systems
Milwaukee Area Technical College - Sustainable Facilities Operations
Laney College - Commercial HVAC Systems
City College San Francisco - Commercial Building Energy Analysis & Audits

Professional Development Materials, Presentations & Videos
National Institutes
Building Automation Systems Instructor Workshops
Webinars (e.g., BEST Talks)

Faculty Profile Videos
Reports & Case Studies
Marketing Resources

BEST
Building Efficiency for a Sustainable Tomorrow

NSF National Science Foundation